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ABSTRACT

The Fairview Reading Curriculum Based Assessment (CBA), which was used in a cross categorical elementary school resource program at Fairview Elementary School in Darien, Illinois, is described. The test measures oral reading accuracy, rate and comprehension on passages taken directly from the two basal reading series used in the school. As the child reads orally, a testor records errors and uses a stopwatch to time the reading of the first 100 words of the passage. Immediately after reading, the child answers five comprehension questions for each passage. Procedures for norming the CBA are considered. Also discussed are student selection; testing; and calculation of accuracy, rate, and comprehension. Noted among findings is that improvement in reading rate will not necessarily improve comprehension. It is concluded that the CBA can be used to identify particular reading problems, for initial group placement of new students, and to identify entrance or exit criteria for resource students. Included are sample reading test passages and comprehension questions, a handout on error samples, a volunteer training session handout, and tables with statistical data. (SW)

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DEVELOPING AND NORMING A
CURRICULUM-BASED ASSESSMENT IN READING

By

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Council for Exceptional Children, Washington, D.C.
April 23, 1984

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Because of the rapidly-growing body of research indicating that performance on a standardized achievement test does not necessarily correlate well with regular class success for special education students (Eaton and Lovitt, 1972, among others), resource teachers are beginning to look for more meaningful methods of assessment. What is needed is a tool that can be used both for placement and as an ongoing measure of progress. The Curriculum-Based Assessment (CBA) described by Idol-Maestas (1983); Jenkins, Deno, and Mirkin (1980); Haring, Lovitt, Eaton, and Hansen (1978); and Blankenship (1981) meets this need.

Simply by testing students over the material in which they have been instructed, successful teachers have always used "curriculum-based assessment." Teacher-made Informal Reading Inventories are quite often taken from the school's curricula, and even the traditional weekly spelling tests given in so many classes are an example of "CBA." The problem with this type of testing has been its informal nature and the lack of impressive-looking empirical data to support the results. Commercially available standardized tests come with percentiles, grade and/or age norms, and statistics on reliability. But achievement tests were not made to measure an individual's mastery of a particular curriculum, nor as a device to make specific instructional decisions (Haring and Gentry, 1976). Another problem with achievement tests, demonstrated at the Experimental Education Unit at the University of Washington by Lovitt (1976), was that the scores did not correlate well either with class placement or with scores on other achievement tests given at the same time. The CBA is often a

better measure of how well the child is meeting the expectations of the regular class, simply because it is taken from the material that is being used in that classroom.

The reading CBA described in this paper has been used in a cross-categorical resource program at Fairview Elementary School, in Darien, Illinois, for three years. It provides very specific information for classroom teachers and parents, and is invaluable for setting goals and determining the extent to which goals have been met. Modeled after the test described in a manual developed by graduate students in the Resource/Consulting Teacher Program at the University of Illinois (Idol-Maestas, et al 1980), it measures oral reading accuracy, rate, and comprehension on passages taken directly from the two basal reading series used in the school. To determine a more reliable score, the test is given on three separate days. As the child reads orally, the tester records errors and uses a stopwatch to time the reading of the first one-hundred words of the passage. Immediately after reading the passage, the child answers five comprehension questions.

During the first two years that we used the CBA, our criteria for placement was taken from the University of Illinois manual. Students were placed in the highest reading book in which they scored at least 95% accuracy, 80% comprehension, and 30 Correct Words Per Minute. (50 Correct Words Per Minute for students in 4th, 5th, and 6th grades.) The CBA was found to be very useful in measuring and reporting pupil progress, but less reliable as a placement tool. Students often met the criteria for placement and yet continued to have trouble reading in that book in the regular class reading group. For this reason, we decided to develop some local criteria.

DEVELOPING THE FAIRVIEW READING CBA

Because we wanted to test on three separate days, we had to develop three forms of the test. Each form contains one reading passage from every book in the reading series. So we began by selecting three passages from each book. The passages came from the first half of the book, but selection was otherwise completely random. After each passage was evaluated to be certain it made sense out of context, two photocopies of it were made. One copy would be used by the tester, and one copy by the student being tested.

Student Copy

The student copies were first arranged into tests. The three different passages from each book were randomly distributed into the three tests. For example, from Book 4 (Preprimer), page 21 might be in Test A, page 13 might be in Test B, and page 24 might be in Test C. When all of the passages had thus been distributed, the three tests were put into ring-binders. At this point, we had three notebooks, labeled "Test A, Student," "Test B, Student," and "Test C, Student". Each notebook contained a complete set of stories, one from each book, beginning with the first book at first-grade level and ending with the last sixth-grade book.

Insert Figure One about here

Tester's Copy

The testers' copies of the passages were next arranged sequentially into notebooks exactly as the student copies were, so that we

now had two identical copies of each test. The second copies were labeled "Test A, Tester," "Test B, Tester," and "Test C, Tester." As with the student copy, each tester's copy contained one story from every book in the series.

To facilitate scoring rate and accuracy, we marked the tester's copy to show the one-hundredth word. By testing on exactly 100 words, even though the passage might contain more than 100 words, accuracy could be determined simply by subtracting one from 100 for each error. Rate could be calculated by dividing the number of words read correctly by the time required to read the words. Dividing by the number of seconds, this revealed the "Correct Words Per Second," which we converted to "Correct Words Per Minute" by multiplying by 60. For example, if a student made four errors, his accuracy would be $100 - 4$, or 96%. Suppose it took 80 seconds (one minute and 20 seconds) for him to read the timed passage. His rate would be determined by dividing 96 (the number of words correct) by 80 (the number of seconds). This would be 1.2 correct words per second, which multiplied by 60 equals 72 correct words per minute.

Finally, we wrote five comprehension questions for each passage, being careful to include a balance of literal and higher-level questions. We tried to use approximately 60% factual, 20% sequential, and 20% inferential, as recommended in the University of Illinois manual. The questions were attached to the tester's copy of the passage.

Insert Figure Two about here

NORMING THE CBA

Once the test was developed, we faced the task of establishing our own criteria. This involved training volunteers to test students, selecting the students to be tested, and scheduling testing periods which did not interfere with teachers' instructional time.

Tester Training

In order to test a large enough sample of children without disrupting our regular program, we used three parent volunteers to administer the tests. The volunteers attended two general training sessions and approximately four practice sessions. In the general training sessions, the testers were taught to listen for oral reading errors, mark the errors on a data sheet, use a stopwatch to time the reading, and ask oral comprehension questions. The volunteers were given a description of exactly what should be counted as an error, and part of the session was spent modeling oral reading and comprehension errors.

Insert Figure Three about here

Because the volunteers had no previous experience listening for reading errors, this was the most time-consuming part of the training. Each volunteer continued to attend practice sessions until she demonstrated 90% reliability on all facets of scoring. We used tape-recordings of students reading from the test for the first practice sessions and had students come in and read for the volunteers in the final training sessions. An outline of the general training sessions follows.

Insert Figure Four about here

Selection of Students

Five students from each class in grades two through six were tested. Since we have three sections of each grade, this resulted in 15 students in each grade level, with a total sample of 75 students. The names were randomly generated from class lists in the school's Apple computer system.

In grades two through five, the students were tested in four different books. They began with the book one level below their grade-placement and continued through the two books at grade level to the first book beyond their actual placement. For example, a 4th grade student would be tested in the 3-2, 4-1, 4-2, and 5-1 levels. Since the reading series ends with sixth grade, sixth-graders were tested at only three levels (5-2, 6-1, and 6-2).

Testing

Each child was tested three times, in order to get a median score. The testing sessions each lasted approximately 15 minutes. Some of the second-grade sessions took longer, depending on the student's rate of reading, and the sixth-grade sessions generally required less than 15 minutes. Testing sessions had to be scheduled to accommodate both the volunteer testers and classroom teachers, and therefore it was impossible to be sure that the students were always tested by the same person or on consecutive days.

At the beginning of the first session, the tester explained to the student the purpose of the project and the procedure to be followed. Students were told that they had been randomly selected and were not being

tested because of any problems they might be having in school. They were told that they were helping us find out if this was a good test.

On each of the three testing days, the student read in sequence the four stories over which he was being tested. The tester started the stopwatch when the student began reading, and stopped it after the one-hundredth word. When a student asked what the stopwatch was for, he was told that he wanted to find out how long it takes someone to read these stories. While the student read, the tester recorded substitutions, omissions, and additions of words and also any times which the student struggled with a word for five seconds or lost his place. The tester provided help only with the last two types of errors, which would otherwise completely interrupt the test.

At the end of each reading passage, the tester asked the student five comprehension questions. The questions were read aloud to the student in the sequence in which they were written on the tester's copy of the passage. Students were not allowed to look back at the story to find the answer.

Calculations

After the student completed all three days of testing, the resource teacher collected the data and calculated accuracy, rate, and comprehension. The formula for each calculation is given in Figure Five.

Insert Figure Five about here

When this was done, the median scores for each level were identified. For example, if a student's accuracy in book 7 was 96% on Test A,

95% on Test B, and 99% on Test C, the median, or middle score, would be 96%. The median scores for rate and comprehension at each level were determined in the same manner.

RESULTS

Norming the test was a relatively simple procedure. First, we calculated the mean and standard deviation for each grade level subtest on each book. Table 1 shows these results.

Insert Table 1 about here

Second, we used the scores from the two grade level books to estimate the criteria. For example, from the second grade comprehension scores in Table 2, we estimated the criteria to be 85, based on books eight and nine (levels 2-1 and 2-2).

Insert Table 2 about here

Once we estimated the criteria, we ran a t-test to see if this estimation was significantly different from the actual mean scores for each book tested. Table 3 gives an example of this calculation for second grade comprehension scores.

Insert Table 3 about here

If the estimation was significantly different, we revised our criteria and repeated the procedure.

We used this method to develop criteria for accuracy, rate, and comprehension at each grade level. The accuracy criteria was 97% at all

grade levels. The criteria for rate was 95 Correct Words Per Minute at grades two and three and increased to 105 for fourth grade, 132 for fifth grade, and 140 for sixth grade. The comprehension criteria was 80% for grades three, five, and six and 85% for grades two and four. Table 4 summarizes the final criteria.

Insert Table 4 about here

DISCUSSION

Although we developed these tests to provide criteria for students in our school, during the testing procedure and in analyzing the results we also uncovered several unanticipated findings. These proved to be as important as the establishment of the criteria. Most of our findings held across grade levels, but a few were unique to our sixth grade sample. First we will present our findings concerning the accuracy, rate, and comprehension scores and then turn to our special case of the sixth grade.

At all grade levels, accuracy was extremely high and consistent from book to book with the exception of level 17 in fifth grade and level 19 in both fifth and sixth grades. This discrepancy could indicate that the passages chosen from level 17 and level 19 are easier to read. The difference in scores, however, is not significant, so the results are more likely due to chance error.

The accuracy scores decreased slightly and the standard deviation increased slightly as the books became more difficult. This suggests that individual differences in accuracy may be more apparent as material gets more difficult but that a teacher can expect a consistently high degree of accuracy independent of the difficulty of the text. Our criteria of 97%

was slightly higher than the 95% suggested in other research (Idol-Maestas, 1980). We attributed the high accuracy scores to the school's emphasis on accurate reading from the first day in school. Oral reading is a daily practice in every reading group.

In grades two through four, reading rate followed a similar pattern as accuracy. As the material became more difficult, the rate declined. Standard deviation (SD), however, did not show a similar decline but remained relatively constant with the exception of one book per grade level which had a narrow SD. The book with the smallest SD turned out to be the one in which most children in the sample were reading at the time we administered the test. The consistency of the SD for the other books indicates that individual differences in rates remain unchanged despite the level of the material. We checked this conclusion by correlating the rate for the easiest and hardest book for the sample and found a correlation of $+0.92$. Apparently, the students who read more quickly in the easier book continued to read more quickly as material became more difficult.

When compared from grade to grade, reading rate showed the most dramatic increase. Whereas the criteria for accuracy remained constant (97%) and the comprehension criteria varied only from 80% to 85% quite independently of grade level, CWPM increased from 95 in grades two and three to 140 in grade six.

The most important finding concerning rate, however, is that although it correlates highly with accuracy for grade level books ($+0.52$), the correlation with comprehension is very weak. For all students in the sample, rate correlated $+0.11$ with comprehension. This suggests

that teachers' efforts to improve reading rate, if successful, will not necessarily improve comprehension. Since rate does not affect comprehension, the teacher should continue to teach comprehension and not work only on improving the student's reading speed and accuracy.

Of all three subtests, comprehension was the most interesting and most confounding. Both the mean scores and standard deviations had large variations. Also, the final comprehension test score on the hardest book for grades two, three, and four was significantly lower than scores on the previous two books. The most striking result was the students' poor performance on the first level tested each day. Almost without exception, students scored better on the second comprehension test than the first, despite the fact that the first test was from an easier book. Moreover, correlations between the scores on the first two books varied from $-.05$ to $+.87$. The fact that scores on the first test were not associated with scores on the second test indicates that either the tests were not related measures of comprehension or that test "jitters" explained the initial low scores. We are inclined to accept the text anxiety hypothesis for several reasons. First, with the exception of the first test, for grades 2-5 the comprehension scores declined as the level became more difficult. As expected, the scores on the hardest book were the lowest. Second, as the material became more difficult, correlations between successive levels became consistently higher. This implies that students who did well on the second level maintained their high scores on more difficult tests, and those who scored poorly continued their subpar performance. Third, the CBA comprehension tests appear to be a valid measure of reading comprehension. By analyzing

the type of question missed, we confirmed our expectations of the test results based on our knowledge of how comprehension is taught in our school. Sequential questions were more often correct, and inferential ones were most frequently missed. At our school the teaching of comprehension emphasizes story mapping, which teaches students to identify and sequence the main ideas of the story. Also, although a five-question comprehension test is only a crude measure of reading comprehension, the comprehension scores are consistent with the students' comprehension scores on the Stanford Achievement Test (SAT) given in the spring of the previous year. For all grade level books, students' comprehension scores on the CBA correlated at +.34 with the standardized scores on the SAT for grades 2-5. Since the comprehension tests proved to be consistent, valid measures of reading comprehension, we believe the low initial test scores were caused by test anxiety or a need to "warm up" for test taking.

The above discussion only concerned second through fifth grade, because the sixth grade appears to be a deviant case. Comprehension scores improved with material difficulty, the SD narrowed, the mean score on level 18 for sixth grade was significantly below the mean score on level 18 for the fifth grade, and the fifth and sixth grades had identical scores on the level 19 comprehension tests. Our first inclination was to blame the unexpected results on poor samples. Being a random sample, however, we chose to first examine the tests before laying blame on "luck of the draw." The test itself appears to contribute strongly to these findings. The correlation between scores on levels 19 and 20 is -.02 indicating that differences in scores on the two books are due to chance rather than comprehension ability. The

correlation between level 18 and 20, however, is +.68 indicating that the score on the first test was associated with the score on the final test. The level 19 test appears not to be a very good one, and we plan to revise it.

CONCLUSIONS

The CBA has limitations but is a valuable assessment tool. From our project we conclude that it can be productively used in the following manner:

1. Identifying particular reading problems. Knowing the criteria and standard deviations enables the tester to determine if a child is significantly below grade level in accuracy, rate or comprehension. Instruction in the particular area can then be planned and implemented.
2. Initial group placement for new students. By matching scores of the child tested with scores of other students in the sample, the new child can be grouped according to his needs. Usually, teachers rely on informal reading inventories, a quick reading assessment, or a parent's report of the child's reading ability since records are not often immediately available. The CBA can be a more accurate placement tool, and scores can be used in conjunction with records when they arrive to determine proper placement.
3. Identifying entrance or exit criteria for resource students.
A significantly low score on the CBA can be an indication of a need for resource placement. Also, knowing the norm

for the grade level, the teacher has a distinct criteria for which to aim. Periodically during resource instruction, the CBA can be used to monitor student's progress. Once he achieves grade level criteria, he can be released from the program.

The norms we developed at Fairview are slightly higher than those recommended in the literature. Establishing our own criteria has enabled us to evaluate students' current reading ability and progress more precisely.

Although educators may prefer to use CBA criteria which we or others have developed, those who do wish to establish their own norms need to take a few precautions. Be sure to use a random sample from each grade level. Attempts to stratify the sample by selecting students from particular groups will give unreliable, skewed results. Be willing to spend the time required to train testers to a high degree of reliability. To alleviate problems of test anxiety, administer a practice test each day before the actual CBA. Finally, all areas of the CBA should be analyzed in their relation to the school's instructional program, and the norms developed should not be used to evaluate instruction in the school. For example, lower inferential comprehension scores or lower scores on a particular book do not indicate a need to emphasize stronger teaching in that area. The CBA reflects instructional emphasis of the school and should be used only to assess an individual student's performance in the school's curriculum.

Figure One -- Student's Copy, Test B (Book 9, Level 2-2)

Oscar was a young otter. He lived by the side of a pond. With the other otters, he would often play on the otter slide, coming down the bank with a great rush, going SPLASH! into the water.

One day, when he was on the slide alone, he came to a corner and SMACK! He ran right into a tree.

"What's the big idea?", Oscar asked the beaver. "That tree is in my way."

"Sorry," said the beaver, "but winter's coming, and I have to build a house." He began to chew down another tree.

Oscar told his father what had happened. "So build another slide," said his father, his mouth full of fish. "There are lots of places."

Source: The Livelong Day, level 9 in the Economy Company reading series. Oklahoma City: Economy Co-Educational Publishers, 1980, p. 42.

Figure Two -- Tester's Copy, Test B (Book 9, level 2-2)

Oscar was a young otter. He lived by the side of a pond. With the other otters, he would often play on the otter slide, coming down the bank with a great rush, going SPLASH! into the water.

One day, when he was on the slide alone, he came to a corner and SMACK! He ran right into a tree.

"What's the big idea?", Oscar asked the beaver. "That tree is in my way."

"Sorry," said the beaver, "but winter's coming, and I have to build a house." He began to chew down another tree.

Oscar told his father what/had happened. "So build another slide," said his father, his mouth full of fish. "There are lots of places."

- f 1. What kind of animal is Oscar? (an otter)
- f 2. What did he like to do with the other otters? (slide)
- f 3. What happened to Oscar on his way down the slide one day? (He ran into a tree)
- s 4. Who did Oscar go to after talking to the beaver? (his father)
- i 5. What do otters eat? (fish)

Source: The Livelong Day, level 9 in the Economy Company reading series. Oklahoma City: Economy Co-Educational Publishers, 1980, p. 42.

Figure Three -- Error Handout for Training Session

What is an Error?

- 1.) Leaving a word out (an "omission")

I will go to (the) school now.

- 2.) Saying a word wrong ("substitution")

Learning to read is not always easy.
(run)

- 3.) Adding a word (an "addition")

(When) She went faster.

- 4.) Pausing for five seconds.

The people (pause) ... were very sad.

- 5.) Skipping a line or getting lost.

- 6.) The first time a student misses a name. (The name only counts as one error.)

They call him Ray Charles. The music of Ray Charles...
(Childs) (Childs)

Figure Four -- Training Session Handout

Volunteer Training Session

Thank you very much for helping us with this important project. Over the past two years, we have developed a reading test which measures students' progress through the specific curriculum used at Fairview School. It is called a "CBA." By testing a cross-section of children in each grade, you will be helping us determine exactly what our students at Fairview can be expected to achieve. We appreciate the time you are giving us!

Outline of Training

- I. Defining Curriculum-Based Assessment (CBA)
 - A. What is it?
 - B. Why do we use it?
 - C. The role of the volunteer
- II. Steps in administering the test
 - A. Counting oral reading errors (Accuracy)
 - B. Timing oral reading (Rate)
 - C. Asking questions (Comprehension)
- III. Learning to count errors
 - A. What is an error?
 - B. How to mark errors
 - C. Practice counting errors
- IV. Using the stopwatch
 - A. Start at the beginning of the story
 - B. Stop at the / mark
 - C. Record minutes and seconds
- V. Asking the questions
 - A. Follow the sequence on the teachers' copy
 - B. Circle the number of each question missed
- VI. Scoring
 - A. Number of errors
 - B. Time
 - C. Number and type of question error
- VII. Confidentiality

Figure Five -- Calculations

Accuracy = 100 - 1 for each error

Rate (CWPM) = $\left\{ \frac{\text{number of words read correctly}}{\text{number of seconds}} \right\} \times 60$

Comprehension = - 0 = 100%

- 1 = 80%

- 2 = 60%

- 3 = 40%

- 4 = 20%

- 5 = 0

TABLE 1
RESULTS OF SUBTESTS

GRADE	BOOK	ACCURACY		RATE		COMPREHENSION	
		MEAN	SD	MEAN	SD	MEAN	SD
Second	7	97.13	1.68	107.00	22.05	78.67	19.22
	8	97.80	2.40	101.67	25.37	92.00	12.65
	9	95.40	3.31	91.73	29.56	85.33	11.87
	10	94.87	4.26	78.93	29.03	73.33	24.69
Third	9	97.90	1.50	115.20	34.60	76.00	22.93
	10	97.60	2.10	103.87	26.40	85.33	14.07
	14	97.10	2.49	102.47	33.67	72.00	23.66
	15	95.20	4.84	95.67	32.21	60.00	30.24
Fourth	14	97.53	1.85	123.53	37.57	80.00	16.90
	15	97.07	2.09	122.53	37.65	89.33	14.86
	16	95.47	2.36	97.87	32.07	77.33	23.74
	17	95.47	4.39	105.60	35.42	57.33	31.95
Fifth	16	97.80	1.70	132.47	29.13	81.33	14.07
	17	98.27	1.75	149.53	31.41	89.33	21.20
	18	96.13	3.20	121.27	22.78	80.00	20.00
	19	96.93	2.87	131.13	31.38	76.00	20.28
Sixth	18	97.13	2.00	136.0	29.76	70.6	35.0
	19	97.47	1.55	150.0	40.70	76.0	22.9
	20	97.00	2.42	141.0	39.47	78.6	14.00

TABLE 2

Second Grade Comprehension Scores

Book	7	8	9	10
Mean	78.67	92.00	85.33	73.33
SE	5.14	3.38	3.17	6.57

TABLE 3

Results of $\bar{T}$ -test for Second Grade
Criterion for Reading Comprehension

Book Level	Criteria	Mean Score	Standard Error ^a	$\bar{T}$ -value ^b
7	85	78.67	5.14	-1.23
8	85	92.00	3.38	2.07
9	85	85.33	3.17	.104
10	85	73.33	6.57	-1.77

^a $SE = \frac{sd+}{\sqrt{n}}$. Since $n=15$, $SD+ = \sqrt{15/14} * SD$ and $SE = (\sqrt{15/14} * SD) / 15$
^b $\bar{T}$ -value = (mean-criteria)/SE. $\bar{T}$ is significant at the .05 level above +2.14 or below -2.14. Since all $\bar{T}$ values are between -2.14 and +2.14, the criteria of 85 is acceptable for all levels.

TABLE 4
Criteria for Subtests

Grade	Accuracy	Rate	Comprehension
2	97	95	85
3	97	95	80
4	97	105	85
5	97	132	80
6	97	140	80

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